

# Abstract

**Moustafa Hussein Aly**

## **FWM Reduction Using Different Modulation Techniques and Optical Filters in DWDM Optical Communication Systems: A Comparative Study**

Next-generation optical communication networks require high input power and more number of channels at low spacing. This can be achieved using dense wavelength division multiplexing (DWDM). However, increasing the number of channels and decreasing channel spacing can enhance fiber nonlinearities, especially the four-wave mixing (FWM). In this paper, different modulation techniques and optical filters are considered and investigated to reduce the FWM effect in DWDM optical communication systems. System performance is evaluated through its quality factor (Q-factor), optical signal-to-noise ratio, optical received power and FWM efficiency. All used techniques have shown a reduction in FWM efficiency. The highest reduction in FWM efficiency is 25 dB and is reported while using modified Duobinary modulation with an increase of 2 in the Q-factor. A comparative study is carried out for the different techniques at 10–20 Gbps bit rate. All simulations are performed through Optisystem.